Copan*Mobile* for Palm

Version 1.0.3

February 18, 2008

Underhill Geomatics Ltd.

Copan

Copan is an ancient ruined city in Honduras where Mayan civilization developed and flourished during the Classic Period (about AD 250-900). A large number of hieroglyphic texts were found here which proved to be valuable for breaking the Mayan code. There is no agreed source of the name but has been said to mean "bridge".

Copan was a centre of culture and science. The Mayan studied astronomy and created a very accurate Mayan calendar.

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for Copan

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REVISIONS

1.0.3 February 18, 2008

1. Gons (grads) has been added to the program. Azimuths and angles may now be entered and displayed in gons or degrees. In the degrees mode, azimuth display is now user selectable to be in decimal or quadrantal format. Azimuths may be input in decimal or quadrantal format regardless of the degrees input format. See the Display Options function which is accessed from the Program menu.

2. User selectable decimals formatting for coordinates, distances, and areas displays has been added. You may now set how many decimals are to be displayed for these values. These settings may be found in the Display Options screen which is accessed from the Program menu.

3. A new function, Reindex Coordinate File, has been added. Copan's coordinate files are indexed to allow quick access of points in large coordinate files. These index files can be corrupted by system crashes. Copan will automatically rebuild these files if the corrupted ones are deleted. This new function provides the user with a quick and easy way of creating new index files. This new function is found in the Coords pulldown menu.

1.0.2 November 2, 2007

1. The Coordinate Transform by Parameters has been changed to perform the calculations in the order of rotate, scale, and translate. The previous order was rotate, translate, scale. This change was made to correct errors in the Coordinate Translate by Points function and to standardize the transformation methodology used in Underhill Geomatics Ltd. Software.

1.0.1 October 31, 2007

1. Program crash when creating a new coordinate file on a SD card with no /Copan directory has been fixed. Program will now create a new directory if necessary.

2. Coordinate Transformation by Parameters was not working correctly if the rotation point was specified by user inputted coordinates rather than by specifying a point in the coordinate file. This has been fixed.

How To Install Copan*Mobile* for Palm

1. Request a software key
Use the Software Request form on Underhill Geomatics Ltd.'s web site (www.underhill.ca) to request a software key. A software key file will be emailed to you. You should receive a software key within an hour.

2. Download the .prc file
Download *copan.prc* file from the Underhill Geomatics Ltd. web site.

3. Place the .prc file on your Palm computer
Copy the .prc file to your Palm. You can use ***palmOne Quick Install*** to link the Palm computer to your Internet connected computer and then copy the file to your Palm. ***Quick Install*** can also be found on the ***Palm Desktop*** program.

4. Copy the key file to your Palm
You will be sent the file *copankey.pdb*. Copy this file to your Palm using ***Quick Install***.

5. Activate **Copan*Mobile***
The first time **Copan*Mobile*** is run, you will be presented with a Disclaimer which you must accept in order to activate **Copan*Mobile***. When requested, enter the eight character password that was included in the email that contained the key file. If activation is successful, you will have access to all the software functions.

Underhill Geomatics Ltd.'s Copan*Mobile* for Palm

Copan*Mobile* for Palm is a Coordinate Geometry (COGO) program for surveyors. It runs on Palm hand-held computers and includes traverse calculations, Coordinate Geometry, area calculations, map check, coordinate transformations, and GPS navigation.

The core of the program is the coordinate file functions. Points may be created and stored in coordinate files. This allows points to be referenced in future calculations. There is no limitation on file sizes except for the Palm system constraints. Points may be imported or exported in comma delimited ASCII format.

Copan*Mobile* allows the user to save data for most calculations to a file. Data may be saved and recalled at a later date. You can continue working on the same data from one session to the next. Files may be created on the Palm memory card or on an expansion memory card.

Copan*Mobile* functions include options to display calculations. Viewing the results graphically is useful for verifying data correctness or for spotting mistakes.

A GPS receiver may be connected to the Palm using the serial port or Bluetooth port. As well, the Garmin iQue3600 is supported. **Copan*Mobile*** with GPS may be used for navigation or position determination.

Coordinate files are compatible with Windows version of Copan. Coordinate files may be copied from Windows computer to the Palm expansion card or vice versa. Alternatively, coordinates may be transferred using comma delimited ASCII files.

Overview of Functions

Main Form:

Pull-down Menus:

Coords

Open – open an existing coordinate file or create a new coordinate file

Close – close the opened coordinate file

Transform by Parameters – transform points in coordinate file using rotation, scale, and translation parameters

Transform by Points – transform points in coordinate file using parameters calculated from a list of similar points

ASCII Import – import points from a comma delimited file to an opened coordinate file

ASCII Export – export points from coordinate file to a comma delimited format file

Reindex – recreate index files used by Copan to access points in coordinate file

Statistics – creates report showing various information about a coordinate file

Calc

COGO – perform coordinate geometry calculations using points in the opened coordinate file

Traverse – calculate and balance three dimensional field traverse and save calculated points in the opened coordinate file

MapCheck – compute closure and area of a parcel using bearing and distances. Curves are supported.

Area – compute the area of a parcel whose corners are defined by points in a coordinate file. Curves are supported.

GPS

Satellites – the locations and signal strengths of satellites in view are displayed graphically

Navigation – a graphic compass display shows heading and speed traveled and bearing and distance to a known point if a destination is defined

Position – average GPS derived coordinates for a point

Program

Display Options – user selectable options

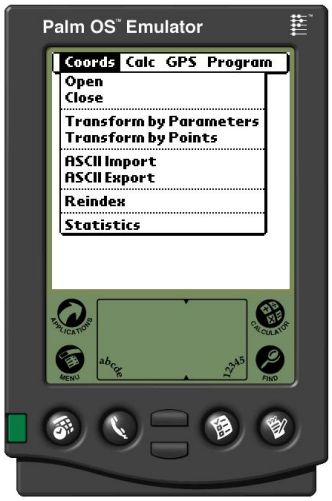
Decimals Options – user selectable angle mode and decimals input/output options

About Survey – display information about the program

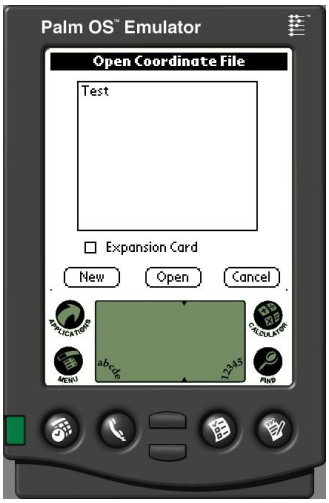
Quick Start Guide

Create a New Coordinate File

Start **Copan*Mobile*** for Palm and this main screen appears. Click on the Copan tab and pull-down menus will appear.



From the "Coords" pull-down menu, select "Open" to create a new coordinate file.



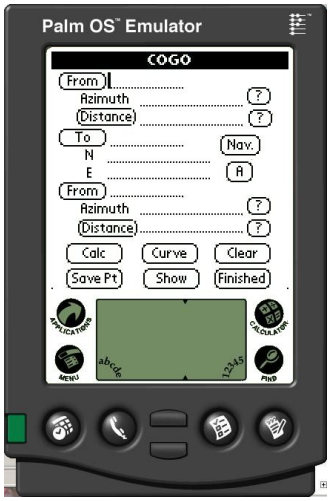
Check the Expansion Card box if one is installed and you wish to create the new coordinate file on the expansion card.

To create a new coordinate file, press the "New" button.

Enter the name of your new coordinate file and press the "OK" button. This will create the new coordinate file and take you back to the main form.

Enter Point Data

From the main menu, select the "Calc" pull-down menu and choose COGO.



From the "COGO" form, press the "Save Pt" button to bring up the "Coordinates" form.

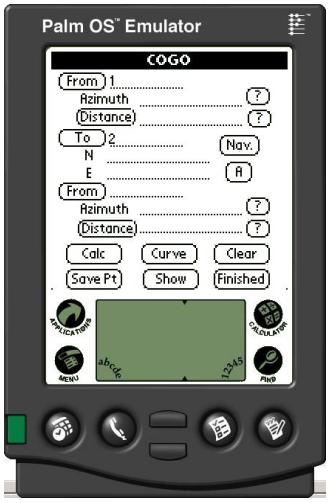
Enter your point data and press the "Save" button to store the point to the coordinate file. Enter more points if you wish.

Press the "Cancel" button when finished inputting points to return to the COGO form.

Perform COGO calculations

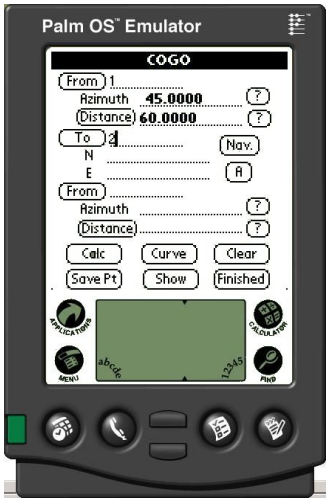
The main features of the COGO form are the data entry fields for up to two "From" points and a "To" point. Depending on how these fields are filled, it is possible to calculate inverses, traverses, and a full range of intersections including bearing-bearing, bearing-distance, and distance-distance.

The key concept in using the COGO form is to enter the information that is known and use the program to calculate the unknown values.



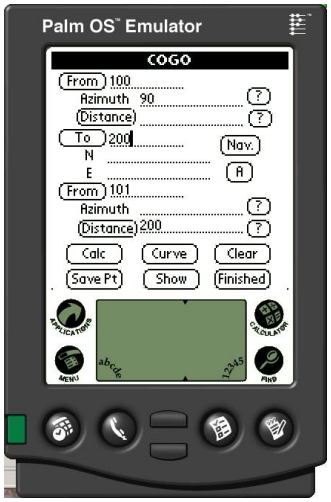
For example, to calculate a bearing and distance between two known points (Inverse), enter a point number in the first "From" field and a point number in the "To" field.

Note: Pts. 1 and 2 were previously defined and are already in the coordinate file.

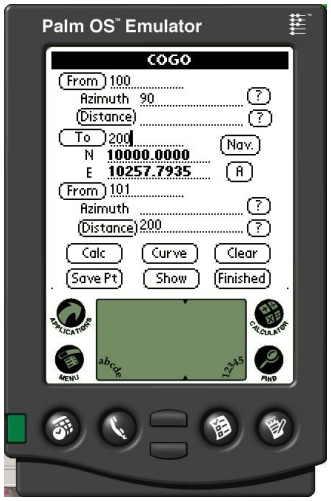


Press the "Calc" button and the calculated azimuth and distance are displayed.

The next example illustrates how an azimuth-distance intersection is calculated. Once again, the known information is entered and the unknowns are calculated if a solution exists.



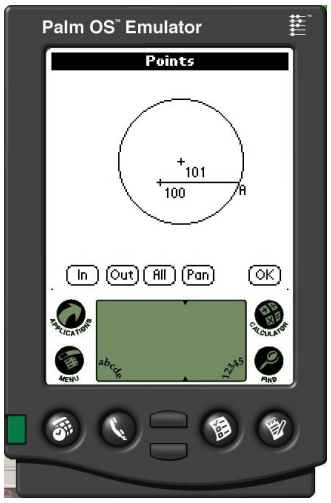
Azimuth-Distance Intersection problem consisting of azimuth of 90 degrees from existing Pt.100 intersecting a new Pt.200 at a distance of 200 from existing Pt.101.



With these known data items entered, press the "Calc" button to attempt a solution. In this case there is at least one solution as shown by calculated coordinates displayed for the "To" Pt.200.

To check to see if there is another possible solution, press the button labeled "A". If there is another solution, the label will change to "B" and different coordinates will be displayed for Pt.200.

Another way to check for other solutions is to press the "Show" button. This will bring up a form which shows graphically the points and calculations.



Pressing the “Show” button on the COGO form will bring up a form showing graphically the points in the coordinate file and the calculation graphics.

This form shows the solution of the azimuth-distance intersection calculation showing a single solution.

Pressing the “OK” button will take you back to the COGO form.

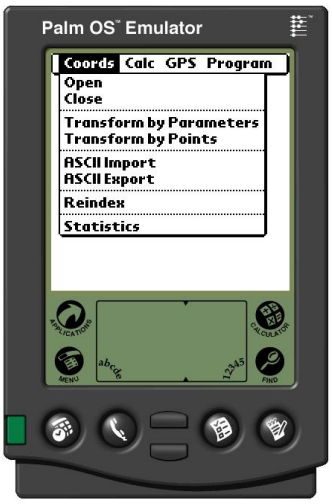
Back at the COGO form, the new Pt.200 may be saved to the coordinate file by pressing the “Save Pt” button. This will open the “Coordinates” form, with the data for Pt.200 present, allowing you to add a note if you wish and then saving the point to the coordinate file.

Learning to create/open a coordinate file, input new points to the coordinate file, and to perform basic Coordinate Geometry calculations will allow you to be comfortable with the **Copan*Mobile*** for Palm Survey software. There are many other features that are available and these will be described in detail in this manual.

Copan*Mobile* for Palm Functions

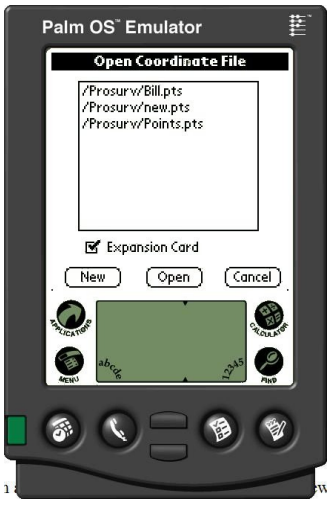
Coordinate Functions

The coordinate functions are accessed from the "Coords" pull-down menu. In general, a coordinate file must be opened before any calculation type function is used.



Open

The "Open" function is used to open an existing coordinate file or to create a new coordinate file. Opening a coordinate file will close any coordinate file presently open. Coordinate files may be created on the main Palm memory card or on a memory card in the Palm's expansion slot.



The "Expansion Card" checkbox on the "Open" form is used to toggle between displaying coordinate files on the expansion card, if one exists, and files on the main Palm memory card.

If you wish to open an existing file, use the stylus to highlight a file and press the "Open" button.

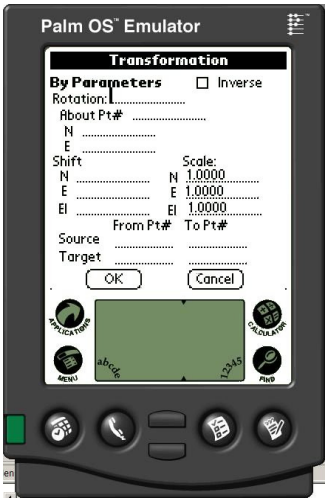
If you wish to create a new coordinate file, choose the location (expansion card or main memory card) and press the "New" key. A new form will appear where you will input the new file name. Next, press "OK" to create the new coordinate file.

Close

The "Close" function will close any coordinate file that is open. There is no form associated with this function.

Transform by Parameters

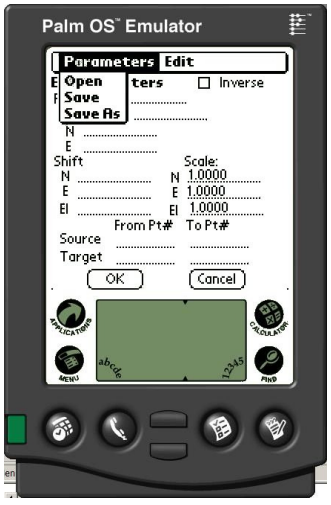
Points in coordinate files may be transformed by first rotating, then scaling, and translating. As this works on points in a coordinate file and writes the results back to the coordinate file, a coordinate file must be opened.



Enter the parameters in the form. Note that values of zero or blank are acceptable if no rotation or shift is desired. However, values of scale must be entered or the new points will have values of 0.0, 0.0, 0.0.

You must specify the range of points to be transformed (Source) and the range of points for the transformed points to be written to (Target).

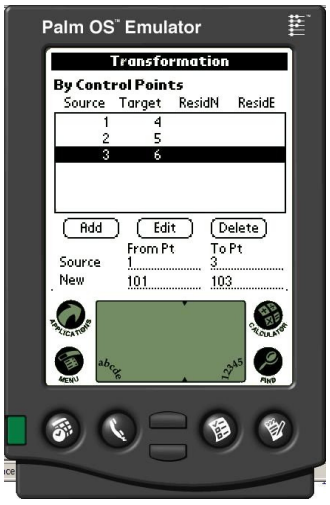
Check the "Inverse" box if you wish to undo a transformation or to translate, scale, and rotate the opposite of the values entered.



The transformation parameters may be saved for future use. Click on the bar at the top of the Transformation form to reveal a pull-down menu which gives you options for saving or retrieving transformation parameters.

Transformation by Points

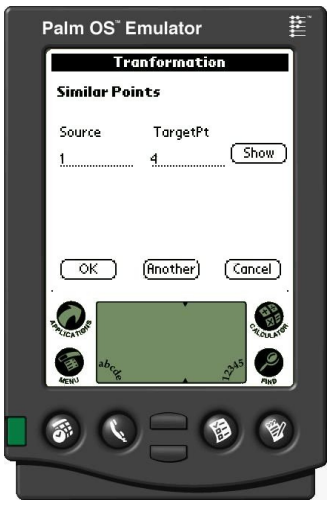
Coordinate transformation may also be defined by corresponding points in two different coordinate systems. Given these point pairs, rotation, scale, and translation parameters may be calculated. These transformation parameters, when applied to the source points, will produce point coordinates that best match the target points.



The Transformation by Points form allows the user to define corresponding point pairs in the coordinate file. In this example, we are transforming from a coordinate system defined by Pts. 1, 2, and 3 to a coordinate system defined by corresponding Pts. 4, 5, and 6.

The points to be transformed are 1 to 3 and the new points are to be numbered in the range of 101 to 103.

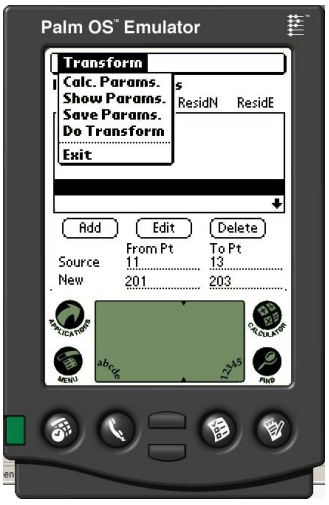
The point pairs shown are entered by pressing the "Add" button which calls the form shown below.



This form is used to add point pairs to the form shown above.

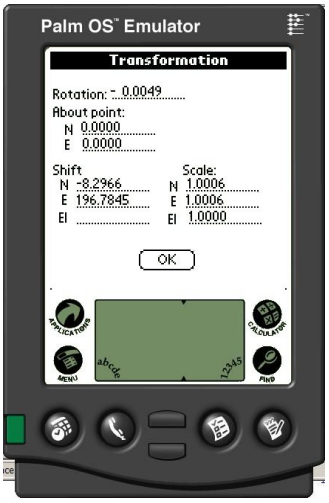
The "Show" button allows selection of points graphically. First use the stylus to select the Source or TargetPt field and then press the "Show" button. In the graphic points screen, select a point by touching with the stylus and then pressing the "OK" button.

The "Another" button is used to accept the current pair and to input another pair.



The pull-down menu of the Transform by Points form is used to:

- calculate the transformation parameters once the point pairs have been defined
- perform the transformation after the parameters have been calculated
- display the transformation parameters
- save the calculated transformation parameters



This is an example of the calculated transformation parameters displayed using the “Show Params.” Menu function.

The transformation parameters saved to a file may be used by the Transform by Parameters. Use the “Open” pull-down menu function on the Transform by Parameters form to load the parameters file.

ASCII Import

Points data in comma delimited ASCII (text) format on a memory card in an expansion slot may be imported into a coordinate file.

Each point may contain the following fields: Number, Name, Northing, Easting, Elevation, Note, and Code. The minimum required fields are Number, Northing, and Easting. The fields may be in any order.

The following form is used to set-up the import format.

In addition to defining the fields present and their order, you may select the method of handling imported points that use point numbers already used in the coordinate file.

The choices are:

- Always replace
- Never replace
- Ask before replace
- Renumber

When defining the Input File, be sure the file name is always prefaced by "Card:" to indicate that it is an expansion memory card file.

An alternate method of setting up the input field parameters is to include a header line in the input file which lists the fields in the file.

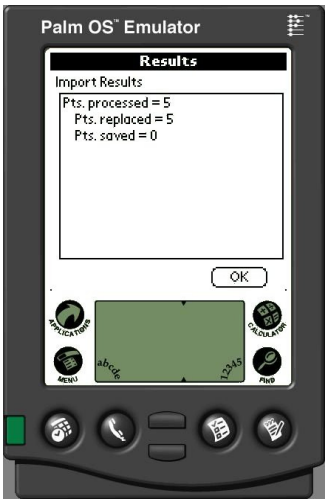
Here is an example of such a file:

```
Number,Name,Northing,Easting,Elevation,Note,Code
1,"",10000.0000,10000.0000,0.0000,"",""
2,"",10100.0000,10100.0000,0.0000,"",""
3,"",10100.0000,10000.0000,0.0000,"",""
10,"",9906.0556,10139.2783,0.0000,"",""
11,"",9964.4772,10110.7842,0.0000,"",""
```

If a header line is included, it is not necessary to manually define the fields in the form. Pressing the "Preview" button will allow the program to parse the header line and come up with the field parameters.

The "Preview" button will parse a point from the input file and display the results. This will allow you to see if the field parameters have been defined correctly.

The Import parameters may be saved for future use. This may be accomplished through the pull-down menu at the top of the ASCII Import form.

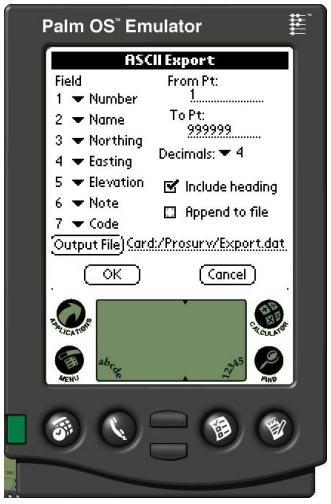


When, you are ready to import the points from the card file, press the "OK" button on the ASCII Import form. This will start the import process. If there are point number conflicts and the method selected to deal with such conflicts, you may be prompted to replace or renumber points.

When the import process is finished, a form will be displayed summarizing the actions taken.

ASCII Export

Points in a coordinate file may be exported to a expansion slot memory card as a comma delimited file. The actual format of each record (point) is user defined.



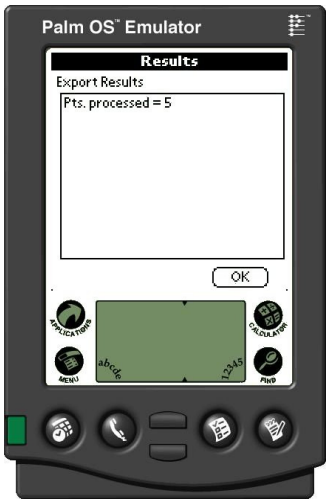
Each of a point's seven fields may be exported and you may determine which are used and the order in an export record. You may also specify the number of decimals in the Northing, Easting, and Elevation fields.

A header, describing the fields exported, may be included and the data may be appended to an existing file.

When specifying the name of the output file, be sure that the name starts with "Card:" to indicate that it is to be written to an expansion memory card.

The Export parameters may be saved for future re-use. Use the pull-down menu found at the top of the ASCII Export form to save the parameters or to load a set of previously saved parameters.

When you are ready to export the points, press the "OK" button.



When the ASCII export is complete, a “Results” form will display the number of points exported.

Below is an example of a comma delimited file, with header, produced by the ASCII Export function.

Export file Export.dat

```
Number,Name,Northing,Easting,Elevation,Note,Code
1,"",10000.0000,10000.0000,0.0000,"",""
2,"",10100.0000,10100.0000,0.0000,"",""
3,"",10100.0000,10000.0000,0.0000,"",""
10,"",9906.0556,10139.2783,0.0000,"",""
11,"",9964.4772,10110.7842,0.0000,"",""
```

Reindex

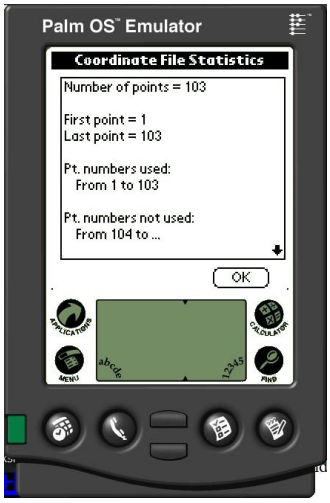
The Reindex function is used to re-create the index files associated with a coordinate file. The index files are used by Copan to quickly access individual points. These index files may become damaged if Copan is not closed properly, either because of a software problem or a system crash.

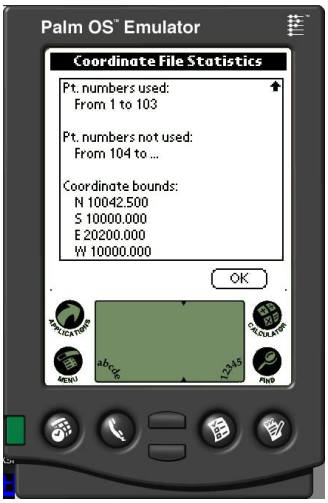
Copan will automatically create new index files if the old ones are deleted. Prior to this version, deleting the index files had to be performed manually. The Reindex function lets the user easily delete old index files and create new ones.

When the Reindex function is chosen, a screen will appear asking the user to select a coordinate file. After choosing a file, click on the Reindex button and the file will be reindexed. If there is a file already opened, it will be closed and the reindexed file will be the default opened file.

Statistics

Statistics pertaining to the opened coordinate file can be displayed by using the Coordinate Statistics function.





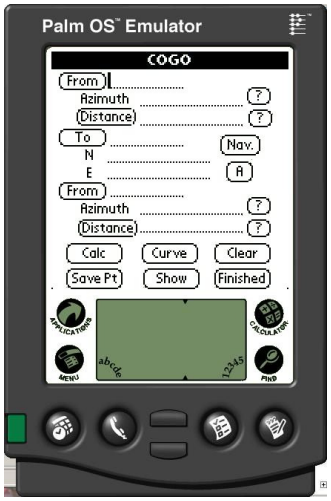
Calculation Functions

The calculation functions are found in the "Calc" pull-down menu.

With the exception of the MapCheck function, a coordinate file must be open before calling any of the calculation functions.

COGO

An introduction to the COGO function was presented in the previous section, "Quick Start Guide".



COGO can use points stored in the coordinate file. To use such a point, enter its number in a "From" or "To" field.

The operations of the "Save Pt" and "Show" were described and the method of calculating inverses and intersections was illustrated.

This COGO form is very versatile as inverse, traverse, and intersection calculations may all be performed with this single form. By filling in the appropriate "From" and "To" fields with known data and leaving the unknown data fields blank, the unknown fields will be calculated (if a solution is possible) when the "Calc" button is pressed.

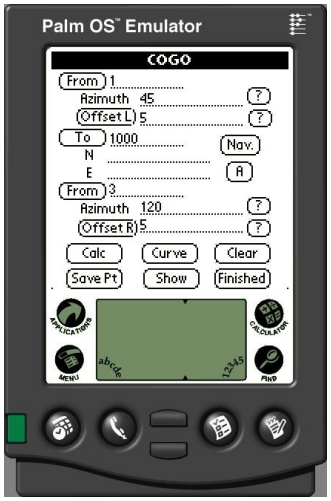
A summary of possibilities is shown below.

Calculation	Fill Fields (from top of form to bottom)
Inverse	From, To
Traverse	From, Azimuth, Distance, To
Azimuth/Azimuth Intersection	From, Azimuth, To, From, Azimuth
Azimuth/Distance Intersection	From, Azimuth, To, From, Distance
Distance/Distance Intersection	From, Distance, To, From, Distance

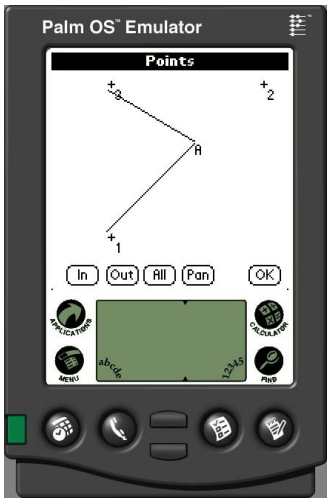
Offsets

In addition to the basic COGO calculations described above, it is also possible to incorporate a distance offset to an azimuth.

The "Distance" buttons (below the "Azimuth" labels), when pushed will toggle between "Distance", "Offset R", and "Offset L". These buttons allows the user to set the meaning of the data entry field to the right of each button.



This screen illustrates the use of offsets in an Azimuth/Azimuth intersection calculation. In this case, the user wishes to offset the first azimuth a distance of 5 to the left from Pt.1 and to offset the second azimuth a distance of 5 to the right of Pt.3.



After performing the calculation (by pressing the "Calc" button), the graphic display can be seen by pressing the "Show" button. The offset intersection results can be seen and a solution, labeled "A" is shown.

In intersections where there are two solutions, the second second solution will be labeled "B". The user may choose the appropriate solution to be saved to the coordinate file by pressing the button provisionally labeled as "A" in the COGO form at the right of the "To" "E" field. Pressing this button toggles between "A" and "B".

Entering Known Point Numbers

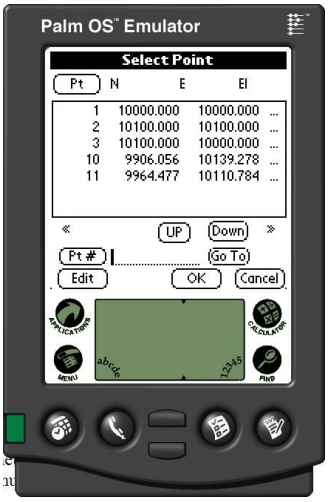
There are three methods for entering the point numbers of points in the coordinate file into the From or To fields of the COGO form. These methods are:

1. Entering the number directly into the field using the Palm keyboard or Graffiti input.

2. Pressing the "Show" button on the COGO form and then graphically selecting the point from the display.

3. Pressing the "From" or "To" buttons to bring up a point list and selecting the point from the point list. The point list form is described below.

Select Point Form

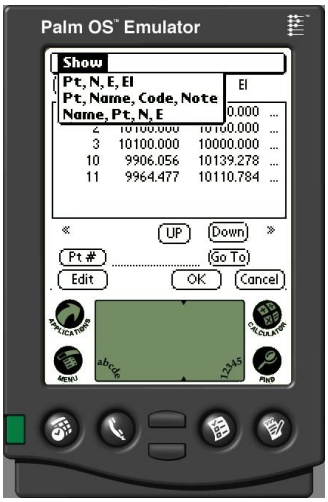


The Select Point form is a method of entering a point number in another form. Selection is accomplished by highlighting a point in the list with the stylus and then pressing the "OK" button.

The "Pt#" button may be pressed to toggle between "Pt#" and "Name" and is used along with the "Go To" button to search for a point in the list.

A point may be edited by highlighting it and pressing the "Edit" key. This opens up the "Coordinates" form with the point data displayed, ready for editing.

The "Pt" button at the top of the first column can be pressed to toggle between an ascending or descending sort of the points.



Point data in the form may be presented in one of three different formats. The format used is chosen through the "Show" pull-down menu.

Azimuth Calculator

The user may enter values directly into the azimuth fields of COGO form or use the Azimuth Calculator to compute a value to be used as the azimuth. This calculator is invoked by pressing the "?" button at the right of an Azimuth field.

The Azimuth Calculator may be used to compute an azimuth between two points in the coordinate file, modify an azimuth by adding or subtracting angle, compute an azimuth from a quadrantal bearing, or a combination of these things.

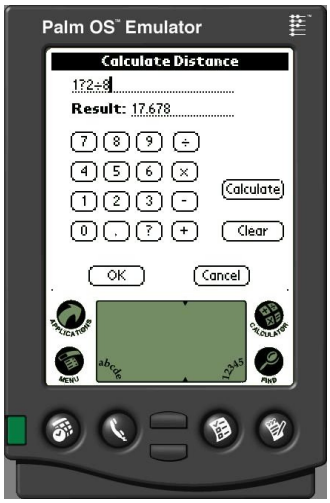
The example shown here computes the azimuth between Pt.1 and Pt.2 and adds 90 degrees to it. The "?" symbol used between two point numbers signifies the azimuth between the points.

Use the keys to enter the expression into the top line and press the "Calculate" key to compute the result.

Pressing the "OK" key will place the result into the Azimuth field of the COGO form.

Distance Calculator

The Distance Calculator can be used to compute a distance for a distance field of the COGO form. The calculator is invoked by pressing the "?" button at the right of a Distance field.



Enter an expression using the keys and press the "Calculate" key to compute and display the result.

This example shows the expression for the distance between Pt.1 and Pt.2 divided by 8. The "?" symbol signifies the distance between the two points.

Press the "OK" key and the value in the result field will be placed in the Distance field of the COGO form.

Curve Calculations

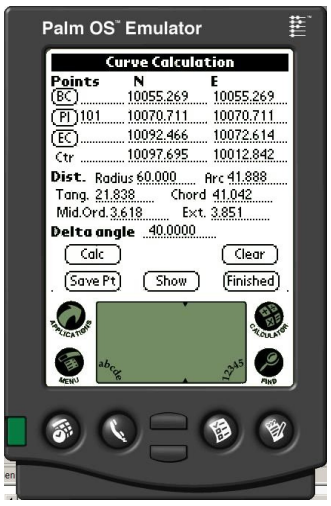
Pressing the "Curve" button on the COGO form will open the Curve Calculation form. This form may be used to design a curve to fit certain points or to calculate unknown curve parameters from a set of known parameters.

The buttons labeled "PI" at the left of the form, when pressed will toggle from "PI" to "BC", "PC", or "EC" depending on the specific button. These abbreviations refer to points on an alignment:

PI – Point of Intersection
BC – Beginning of Curve
PC – Point on Curve
EC – End of Curve

The "Show" button brings up the graphic display and may be used to select points for the point number fields.

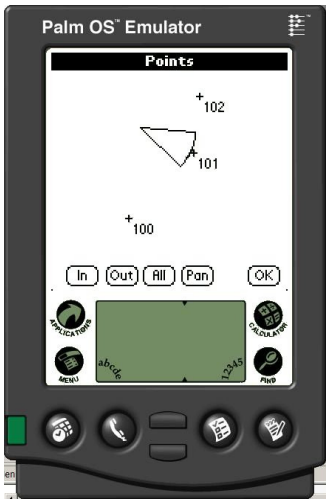
This example illustrates designing a curve to fit an alignment defined by three PIs with a specified radius of 60. With these fields filled, press the "Calc" button to compute the curve. If a solution is possible, the other curve parameters will be displayed.



The curve that fits the alignment has been calculated. The new BC, EC, and center points are shown. As well, the other curve parameters, such as arc length, have been computed and are displayed.

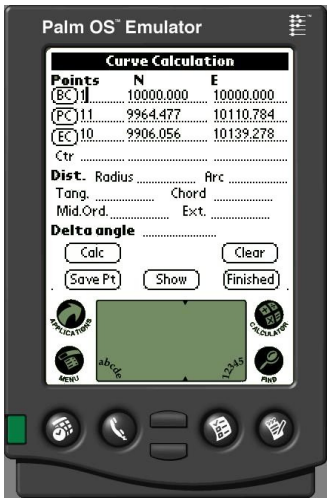
If you wish to save any of the computed points, click the stylus in the "N" or "E" field of the point you wish to save, then press the "Save Pt" button. This will bring up the "Coordinates" form, with the point data filled in ready for saving.

Press the "Show" button to graphically display the curve.



This is the graphical display of the designed curve.

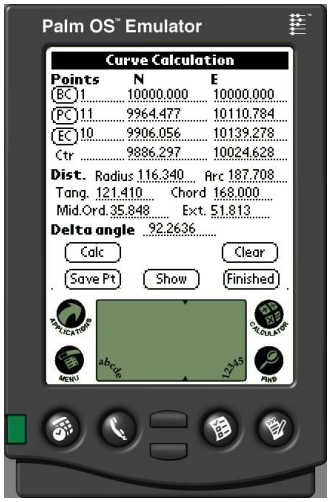
The Curve Calculation form can be used to calculate a curve that passes through three known points.



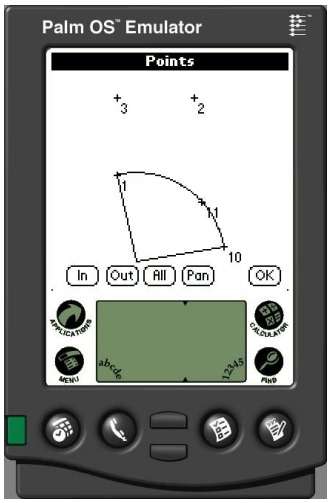
Press the point type buttons until they are labeled “BC”, “PC”, and “EC” as shown on this form.

Input the three points.

Press the “Calc” button.

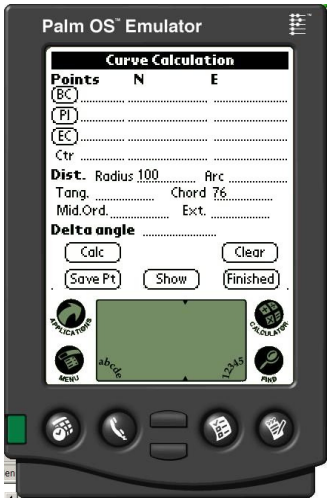


The results are shown on this form.



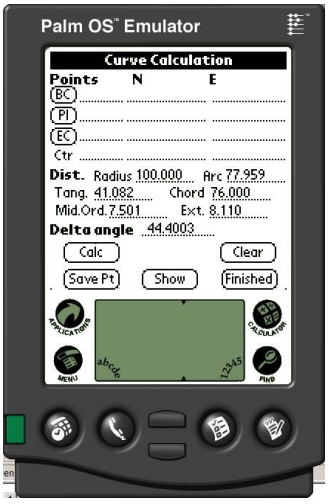
This is the graphic display showing the curve.

The Curve Calculation form may also be used to calculate parameters of curves that are not fixed in space. In this case, simply enter the minimum parameters to define a curve and the remaining parameters will be calculated.



In this example, a curve with radius of 100 and chord of 76 is defined.

Press the "Calc" button to calculate the other parameters.

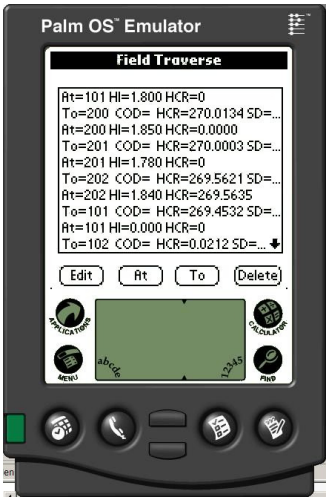


Here are the remaining parameters calculated and displayed.

Various combinations of minimum parameters may be entered and the remaining parameters will be calculated if a unique solution exists.

Traverse

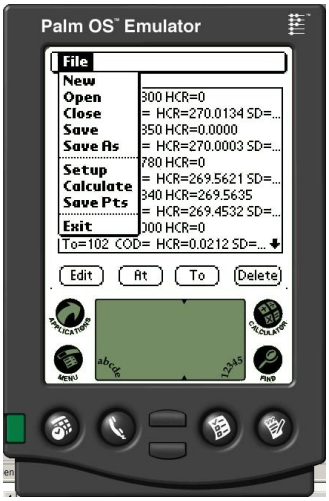
Three dimensional field traverses may be calculated with the Traverse function. The traverses may be open or closed and may include side shots. If the traverse is closed, the misclosure is calculated and the traverse may be balanced. The data may be saved to file for future use.



The main Field Traverse form includes an area displaying the traverse legs. This display is for viewing the data and also for selecting data for editing. The data displayed is in an abbreviated format to fit the screen. To view each line of data fully, use the Edit function.

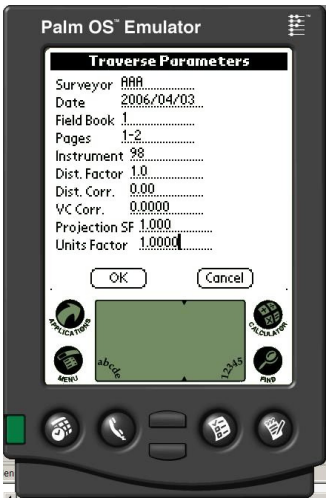
To edit a line, highlight it with the stylus and press the "Edit" or "Delete" button.

To add a new line of data, press the "At" or "To" button.

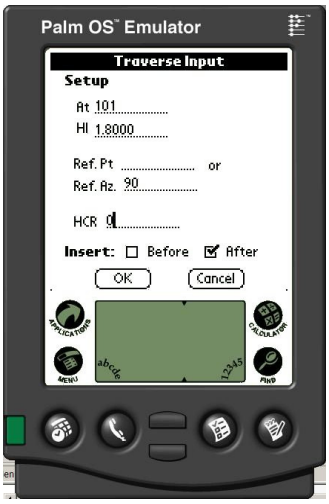


The pull-down menu for the Field Traverse form includes function to save the traverse data to a file and to retrieve traverse data from storage.

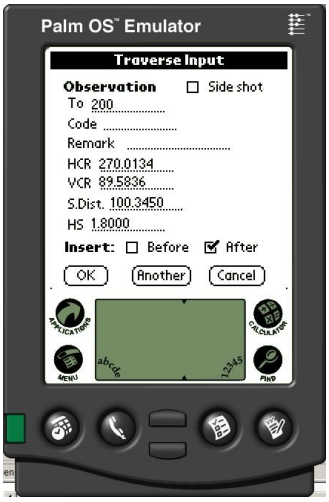
Other functions are for inputting set-up data, calculating the traverse, saving the calculated points, and to exit from the Field Traverse function.



The "Traverse Parameters" form is accessed by selecting "Setup" in the pull-down menu of the Traverse form. This form is used to enter user information as well as data to be used in the traverse calculations.

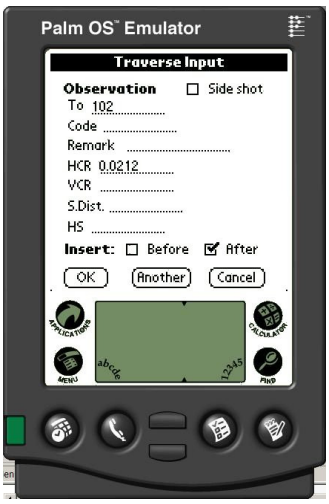


The "At" button of the "Field Traverse" form brings up this form to allow the entry of Setup points.



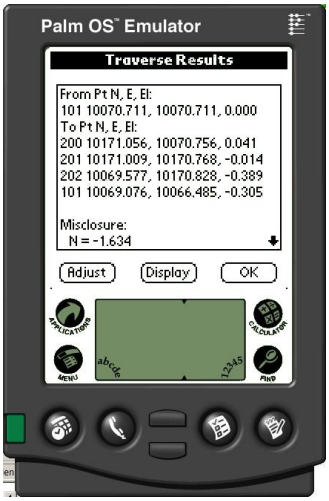
The "To" button of the "Field Traverse" form brings up this form. The "Code" and "Remark" fields are optional. Use the "Side shot" check box to indicate if this observation is not a traverse leg.

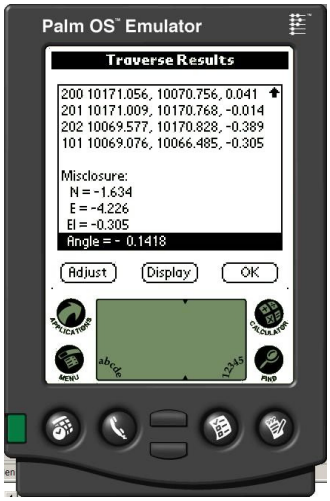
The "Another" button lets you enter another observation (usually side shot) without going back to the main Traverse form.



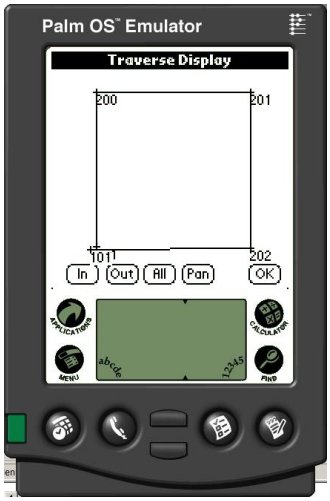
A closing angle may be part of the traverse. This shows how a closing angle is entered. The "To" point number entered is not actually used.

Calculate the traverse by selecting “Calculate” from the Traverse form’s pull-down menu. The calculated coordinates and the misclosure will be displayed.



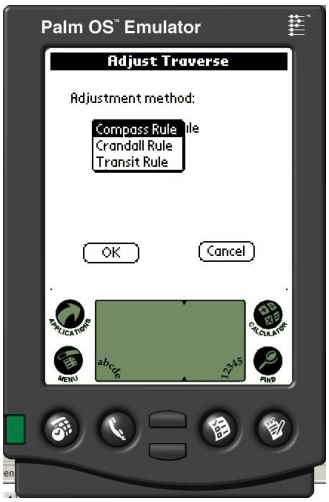


Traverse results.



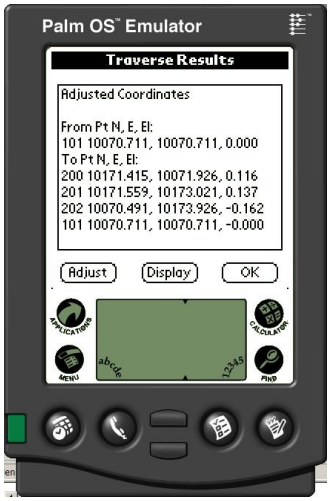
Pressing the “Display” button on the “Traverse Results” form displays the traverse graphically.

The traverse may be adjusted by pressing the “Adjust” button on the Traverse Results form. A choice of three adjustment methods are available.



Choose an adjustment method.

Choose the appropriate adjustment method and press “OK” to proceed with the adjustment. The adjusted coordinates will be displayed.

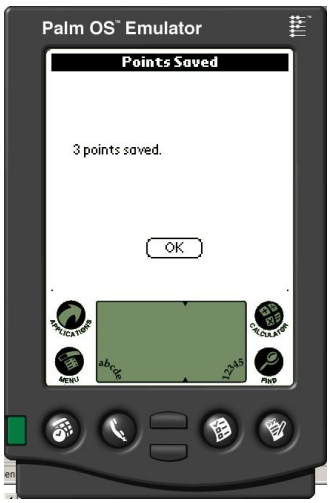


Adjusted coordinates are displayed.

If you wish to save the calculated traverse points to the coordinate file, select the “Save Pts” option from the Traverse form’s pull-down menu.

Select the method of handling existing points in the coordinate file.

Press “OK” to save the points.

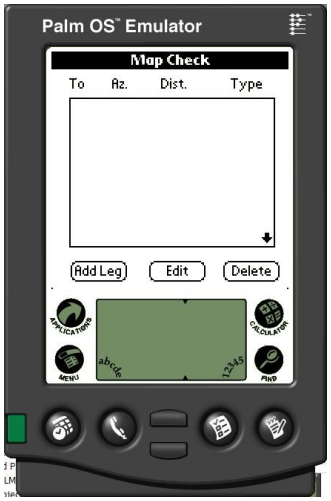


The results of the “Save Pts” operation are displayed.

MapCheck

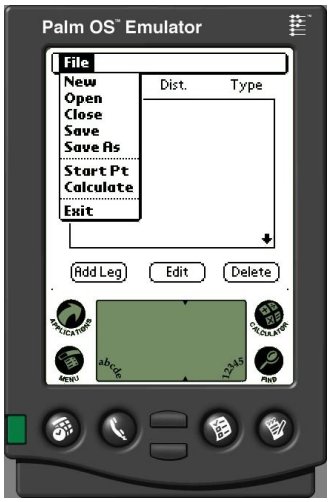
The Map Check function is used to check the closure of a parcel using the azimuths and distances of the boundaries. The closure is calculated along with the area in the parcel. Circular curves are supported in this function.

The Map Check function does not require a coordinate file to be opened. There is no reference to any point stored in a point file.



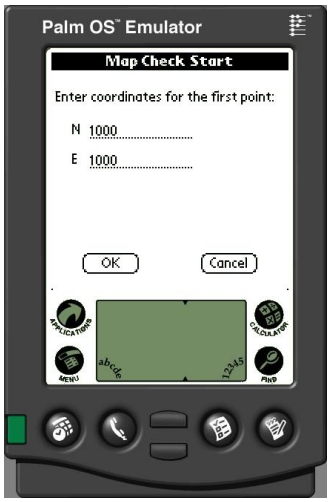
The main Map Check form is used to display the data and to access the function buttons for input/edit of the data.

A line of data consists of a "To" point number (which is optional), an azimuth, a distance, and a classification of the "To" point. The classification is used to differentiate between corner points and points that are used to define circular curves.

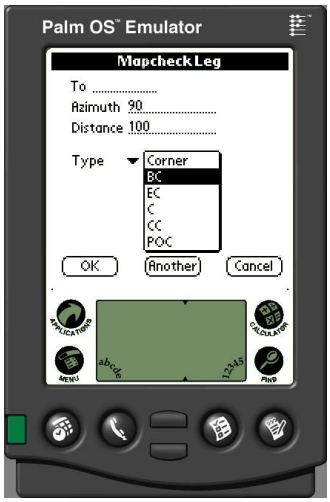


The Map Check pull-down menu includes functions to save and load Map Check data files, define the start point coordinates, perform the Map Check calculations, and to exit the Map Check function.

The file functions allow the user to save the entered data to a file for future reference.



The "Start Pt" choice in the pull-down menu brings up this form. It is used to define the start point coordinates. It is not necessary to explicitly define the start point coordinates but can be done if you wish to view the results based on a specific start point.

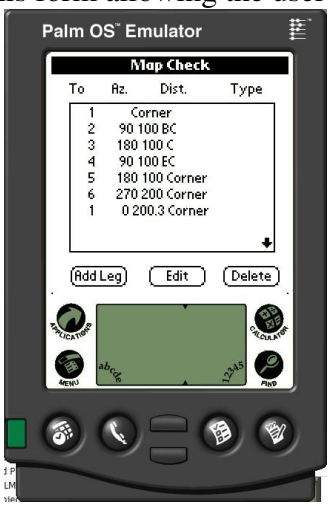


Pressing the "Add Leg" button on the main "Map Check" form brings up this form. Each side of the parcel to be checked is entered from this form.

The data to be entered are: "To" pt which is optional, azimuth, distance, and the classification of the "To" point. The various point types are:

- Corner
- BC = Beginning of Curve
- EC = End of Curve
- C = Center (of curve)
- CC = Counterclockwise Center (of curve)
- POC = Point On Compound curve (point that is the EC of one curve and BC of next curve)

Pressing the "OK" button after the data has been entered will close this form and return to the main "Map Check" form. Press the "Another" button will accept the data and clear this form allowing the user to enter another line of data.

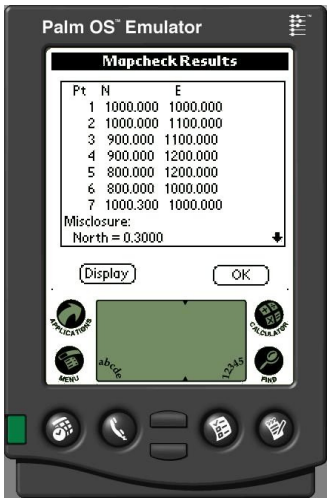


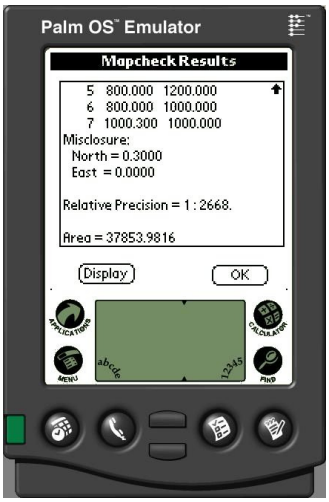
This is an example showing the complete data for a parcel including a circular curve.

The first line of data defines the start point. This data line is entered with no azimuth or distance.

The second point in the parcel is a Beginning of Curve (BC). The third point is the Center of a clockwise curve. The next point is the End of Curve (EC) point.

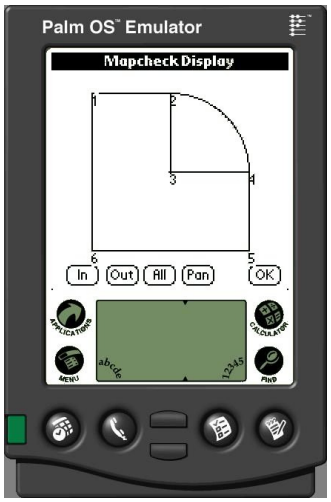
The remaining points are corners that finish back at the start point.





Selecting the "Calculate" option of the pull-down menu results in this form. There is a misclosure indicated.

The area of the parcel is also displayed.

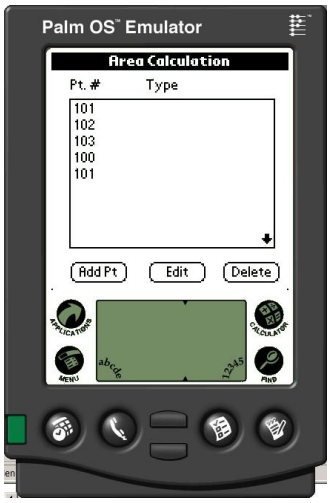


Pressing the "Display" button in the "Mapcheck Results" form will bring up this form. The parcel data is shown graphically and is useful for detecting input errors and to verify that the data is correct.

Area

The area of a parcel may be calculated from points that are stored in a coordinate file. The parcel may include circular curves. This function is similar to the "MapCheck" function described previously with the exception that predefined points are used to define each parcel side.

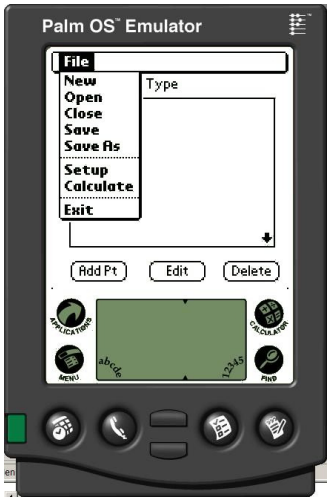
Because, existing points are referenced, a coordinate file must be open for this function to be used.



The main Area Calculation form display the area data. In this example, the data is for a polygon which starts at Pt.101, moves to Pts. 102, 103, 100 and back to Pt.101.

To add data, use the "Add Pt" button. To insert a new point, select an existing point using your stylus and use the "Add Pt" button function to place a new point after the highlighted point.

To edit a point, select the point in the list with the stylus and press the "Edit" or "Delete" button.



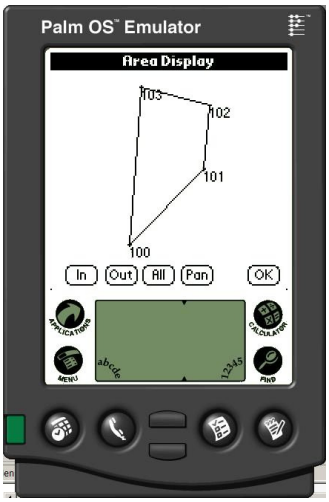
The Area Calculation pull-down menu provides access to the file functions. The area data may be saved to a file and recalled later.

The pull-down menu also provides access to the Setup, Calculate, and Exit options.

The user may enter two different scale factors which are applied to the computed distances between the points prior to the area calculation.

The "Add Pt" button on the Area Calculation form will bring up the Area Point form. This form is used to add a new point which includes a point number and a point type. The point number may be entered directly into the field or pressing the "Show" button will display the points of the coordinate file graphically and allow you to graphically select a point.

The point types are: Corner, BC (Beginning of Curve), EC (End of Curve), C (Center of clockwise curve), CC (Centre of Counterclockwise curve), and POC (Point on Compound curve). The use of the point types is the same as for the Map Check function described previously.



The area data is processed when the "Calculate" option is selected from the Area Calculation pull-down menu. The resulting area is displayed in a new form. Pressing the "Display" button on the Area Results form will graphically show the polygon for which the area was calculated.

GPS Functions

GPS receivers may be interfaced to the Palm computer using the serial port or a Bluetooth port if your Palm computer supports it. **Copan*Mobile*** for Palm will process the NMEA messages received.

The Garmin iQue 3600 Palm-type computer with its built-in GPS receiver is also supported.

Using a Bluetooth Receiver

If you are using a GPS receiver that communicates with the Palm via Bluetooth, you will need to check that the program is configured to check the Bluetooth port. From the main program form, select "Options" from the "Program" pull-down menu.

In the "Options" form, make sure the "Use Bluetooth" box is checked. Exit from the program and restart the program to access the Bluetooth GPS receiver

Menu

The GPS functions are accessed from the GPS pull-down menu. The functions available are:

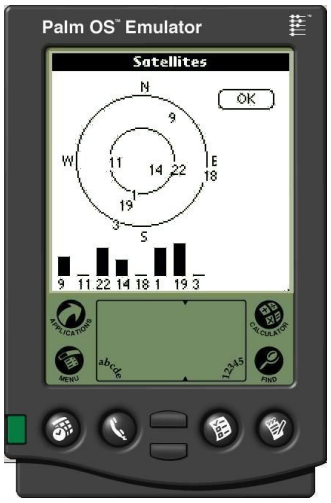
Satellites – display satellites visible and show signal strength;

Navigation – use the GPS to navigate to a known point or to show bearing and speed while in motion.

Position – compute an averaged position for a point.

Satellites

The Satellites function is used to check the visibility and signal strength of GPS satellites. The status of the satellites is displayed graphically.



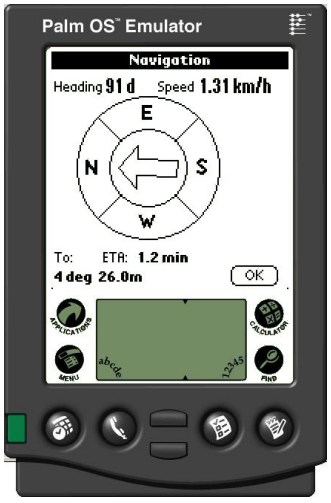
The location of each satellite that is above the horizon is shown on the sky plot. The outer circle is the horizon that is 90 degrees from the zenith. The inner circle represents the altitude that is 45 degrees from the zenith.

The numbers plotted represents that satellites above the horizon. Although, not obvious in this plot, satellites that are locked on are shown in black and satellites not locked on are shown in red.

The bar chart on the bottom of the form displays the signal strength of the satellites.

Navigation

The Navigation form provides two functions. It may be used as a compass to indicate North or the direction of travel while the GPS receiver is in motion; it may also be used to navigate to a point for which UTM coordinates are known.



This screen illustrates the features of the Navigation form. In this case, the computer is being used to navigate to a known point. The compass graphic shows that the direction of travel is eastwards and the arrow is shown pointing North towards the destination being navigated to.

The velocity vector is displayed as 1.31 km/h at a heading of 91 degrees.

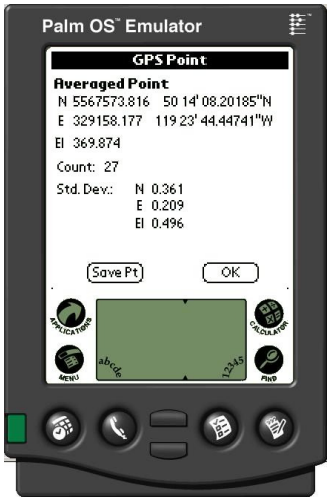
The bearing to the destination is 4 degrees and the distance is 26.0 m. The estimated time to the destination is 1.2 minutes at the present speed.

The "Points" pull-down menu on the Navigation form is used to:

- Get To Pt - specify a point in the coordinate file to navigate to.
- Save Pt – save the point which you are currently at to the coordinate file.

The "Satellites" pull-down menu has one choice, "Status". When this is selected, the "Satellites" form (as described previously) is displayed, showing the satellites sky plot and signal strength bar chart.

Position



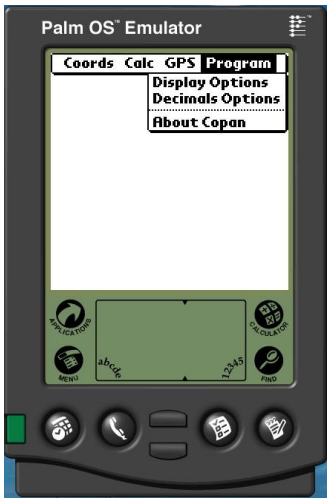
The Position function is used to compute an averaged Northing and Easting for a static point. The form displays the averaged coordinates (including latitude and longitude) along with the standard deviations associated with the means. The number of points used in the calculation is also displayed

Use the "Save Pt" button to save an averaged point to the coordinate file.

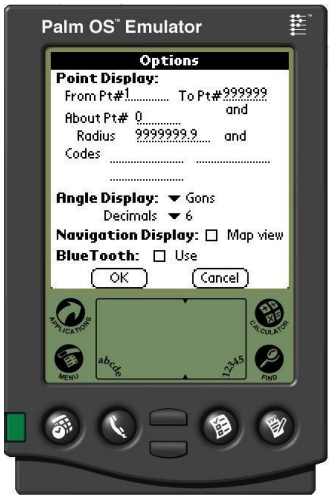
Program Functions

Options

There are a number of options or preferences that the user may set. Once set, they are in effect until they are changed.



The program options can be set by selecting the Program pulldown menu and choosing one of the two options functions available.



The Display Options settings affect the selection of points in the coordinate file which are visible in the graphic display. There are three filters which determine the visibility of points. Points which pass these three tests will be displayed. The filters that can be set are:

- point number range – only point numbers within the specified range are displayed.
- point location – points within a specified radius of a specified point are displayed. If the "About Pt#" is 0, then all points pass this test.
- point code field – points with codes that match one of the specified codes will be displayed. If no codes are specified, then all points pass this test.

The Navigation Display option pertains to the GPS Navigation function. This function can be used with a form that displays a compass-type graphic or alternatively can be used with a map-type display which plots the user's position against a background of points from the coordinate file. Checking the "Map view" box will make the map-type display the default.

The Bluetooth checkbox is used to select the Bluetooth port as the GPS input. If you wish to use a GPS receiver with Bluetooth communications, check this box. Do not check this box if you are using the serial port for NMEA messages or if you are using a

Garmin iQue computer. Unchecking this box will also stop the program from going through the Bluetooth discovery process when the program is started.

When the Bluetooth option is changed, exit and restart the program to allow the change to take effect.

The Decimals Options function is used to set the number of decimals displayed for coordinates, distances, areas, and angles. As well, the angle display mode may be set.

The Angle Display option is used to determine how azimuths and angle are interpreted on input and displayed on output. The choices are Degrees, Gons, and Quadrantal.

When in Degrees or Quadrantal mode, azimuth inputs may be either decimal degrees or quadrantal. Azimuths will be displayed in the mode selected. The number of decimals the azimuths will be interpreted or displayed is also selectable. For degrees or quadrantal modes, the decimals refer to decimals of a second.

The mode chosen will be used for all functions until it is changed.

About Survey

This function displays a program information form. It is useful for determining the program version.